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Brown

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[54] **METHOD AND APPARATUS FOR PROCESSING REQUESTS FOR VIDEO PRESENTATIONS OF INTERACTIVE APPLICATIONS IN WHICH VOD FUNCTIONALITY IS PROVIDED DURING NVOD PRESENTATIONS**

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[51] **Int. Cl.**[6] **H04N 7/173**; H04N 7/14

[52] **U.S. Cl.** **455/5.1**; 348/7

[58] **Field of Search** 348/6, 7, 13, 10, 348/11, 12; 455/3.1, 6.3, 3.2, 4.1, 4.2, 5.1, 6.1, 6.2; H04N 7/10, 7/14, 7/173

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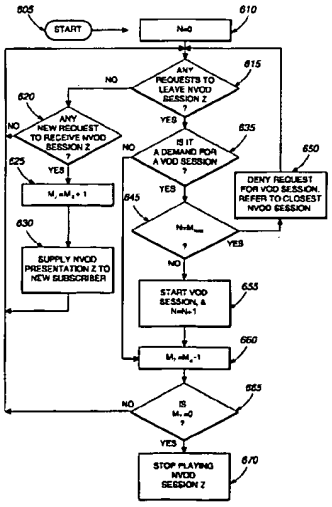
[57] **ABSTRACT**

For an interactive communication system, the invention provides a method and apparatus for processing requests for video presentations of particular interactive applications. One embodiment of the invention initially receives, from a viewing node, a request for a video presentation of a particular interactive application. This embodiment then provides a near-video-on-demand (NVOD) presentation of the interactive application to the viewing node. At the time of the offer of the NVOD presentation, or during the NVOD presentation, the viewing node might request a video-on-demand (VOD) version of the interactive application. If such a request is made, and if the system's resources would not be constrained by the transmission of the video-on-demand presentation of the interactive application, then this embodiment transmits the video-on-demand version of the interactive application to the viewing node. On the other hand, if the system's resources would be constrained by the transmission of the VOD version, one embodiment of the invention's interactive system again directs the requesting viewer to view a near-video-on-demand version of the particular application.

24 Claims, 7 Drawing Sheets



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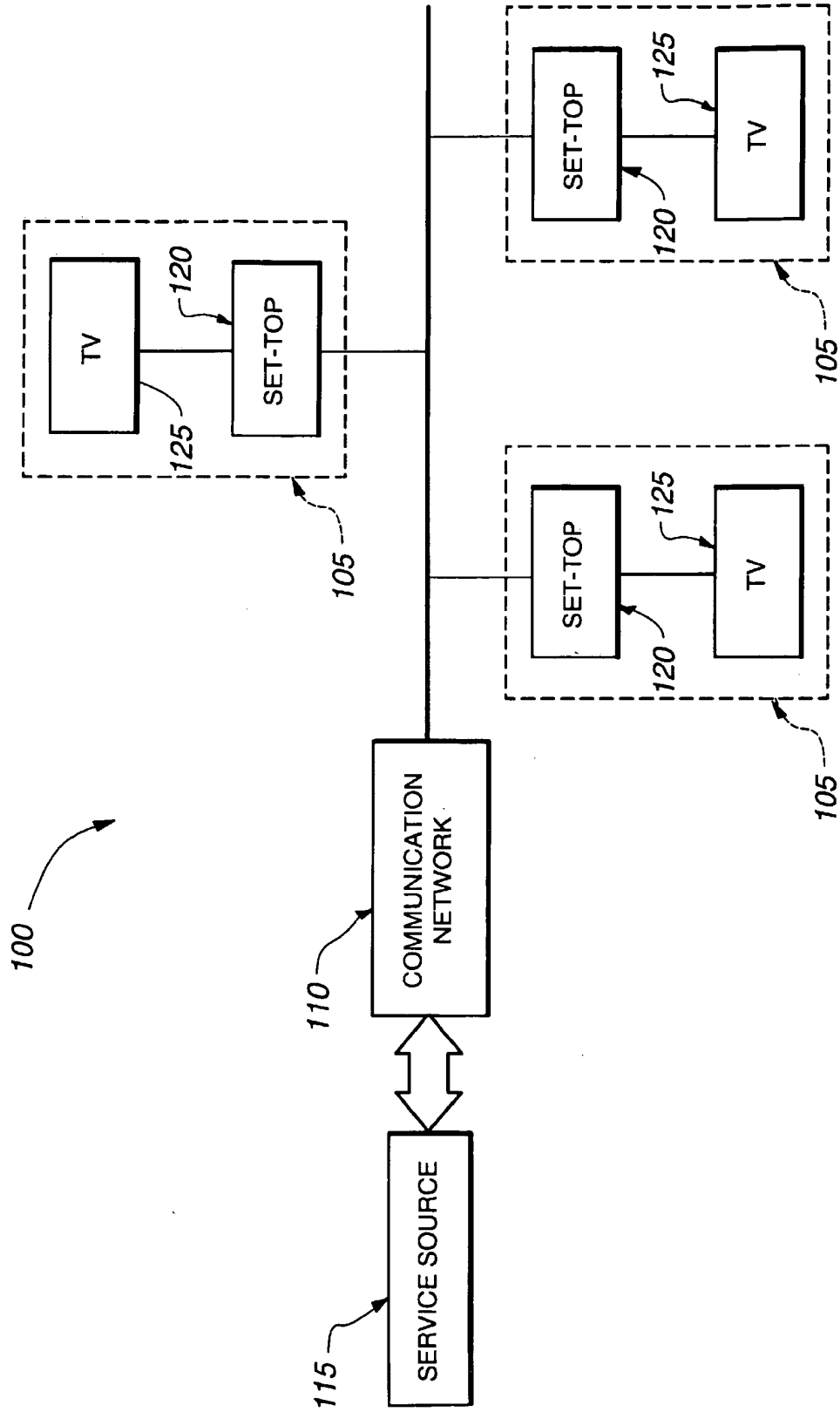
100
110
COMMUNICATION NETWORK
115
SERVICE SOURCE
105
TV
SET-TOP
120
125

Fig. 1

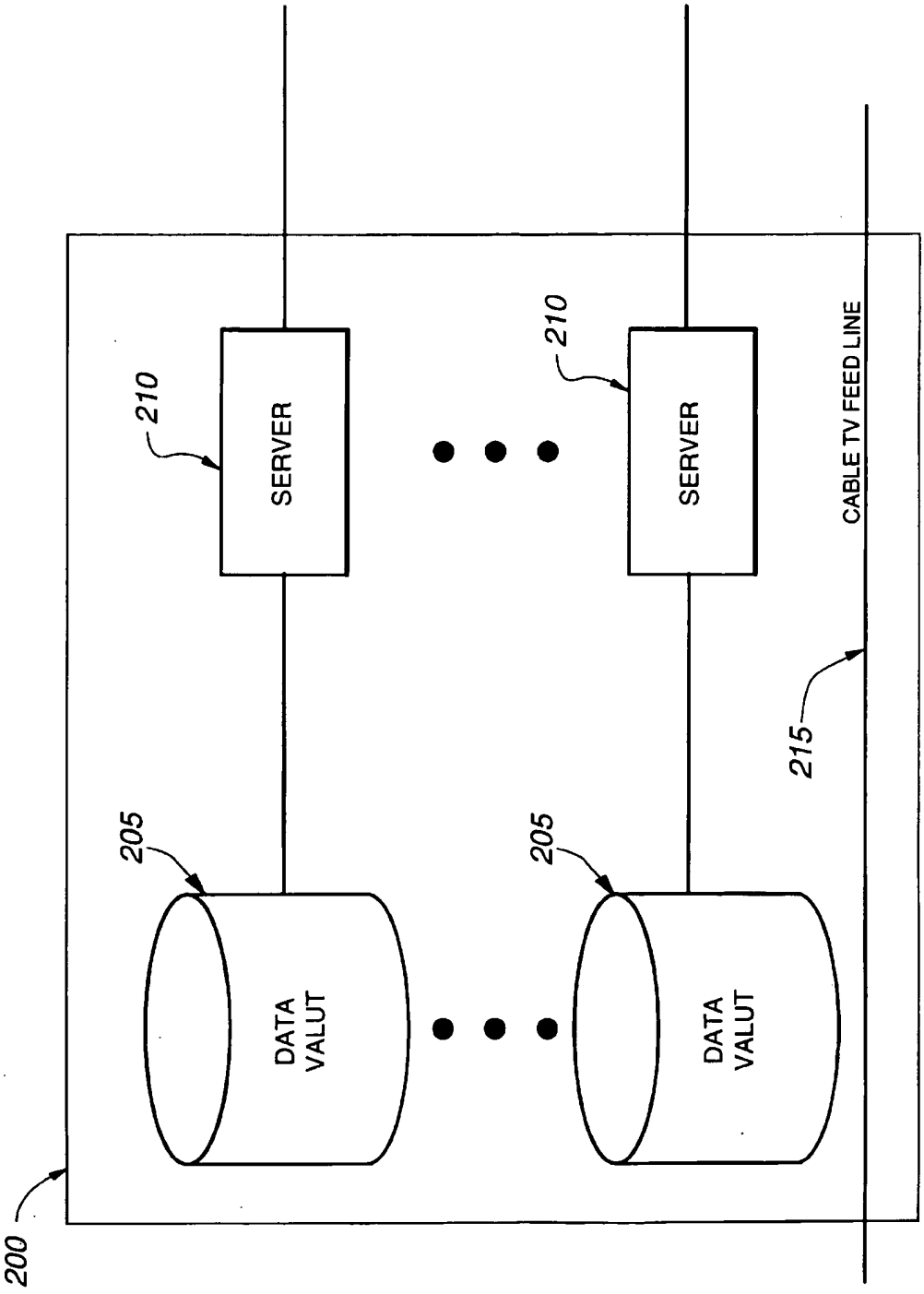
210
SERVER
210
SERVER
CABLE TV FEED LINE
215
205
DATA VALUT
205
DATA VALUT
200

Fig. 2

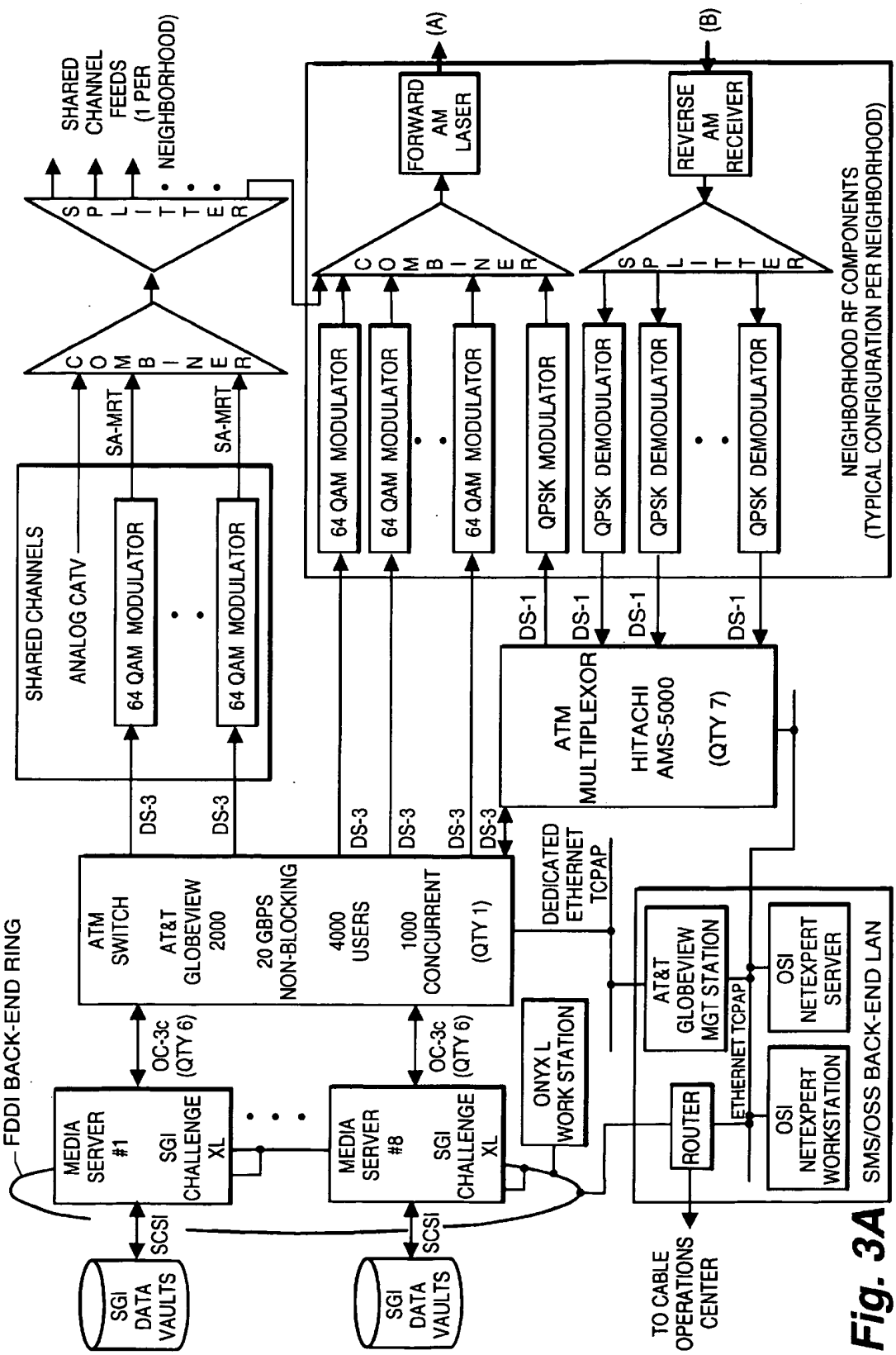
SHARED CHANNEL FEEDS (1 PER NEIGHBORHOOD)
SPLITTER
COMBINER
SA-MRT
SA-MRT
SHARED CHANNELS
ANALOG CATV
64 QAM MODULATOR
64 QAM MODULATOR
64 QAM MODULATOR
(A)
(B)
FORWARD AM LASER
REVERSE AM RECEIVER
COMBINER
SPLITTER
64 QAM MODULATOR
64 QAM MODULATOR
64 QAM MODULATOR
QPSK MODULATOR
QPSK DEMODULATOR
QPSK DEMODULATOR
QPSK DEMODULATOR
NEIGHBORHOOD RF COMPONENTS
(TYPICAL CONFIGURATION PER NEIGHBORHOOD)
DS-1
DS-1
DS-1
DS-1
ATM MULTIPLEXOR
HITACHI AMS-5000
(QTY 7)
DS-3
DS-3
DS-3
DS-3
DS-3
DS-3
DEDICATED ETHERNET TCPAP
ATM SWITCH
AT&T GLOBEVIEW 2000
20 GBPS NON-BLOCKING
4000 USERS
1000 CONCURRENT
(QTY 1)
FDDI BACK-END RING
OC-3c (QTY 6)
OC-3c (QTY 6)
ONYX L WORK STATION
AT&T GLOBEVIEW MGT STATION
OSI NETEXPERT SERVER
ETHERNET TCPAP
ROUTER
OSI NETEXPERT WORKSTATION
SMS/OSS BACK-END LAN
MEDIA SERVER #1
SGI CHALLENGE XL
MEDIA SERVER #8
SGI CHALLENGE XL
SCSI
SCSI
SGI DATA VAULTS
SGI DATA VAULTS
TO CABLE OPERATIONS CENTER

Fig. 3A

Fig. 3

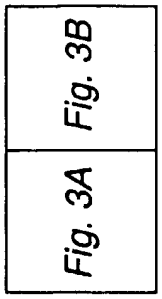
Fig. 3B
Fig. 3A

HCT
HCT
HCT
FEEDER COAX
NEIGHBORHOOD NODE
(APPROXIMATELY 500 HOMES PASSED)
REVERSE
AM LASER
FORWARD FIBER
REVERSE FIBER
OUTSIDE
PLANT
(A)
(B)
NETWORK
OPERATIONS
CENTER

Fig. 3B

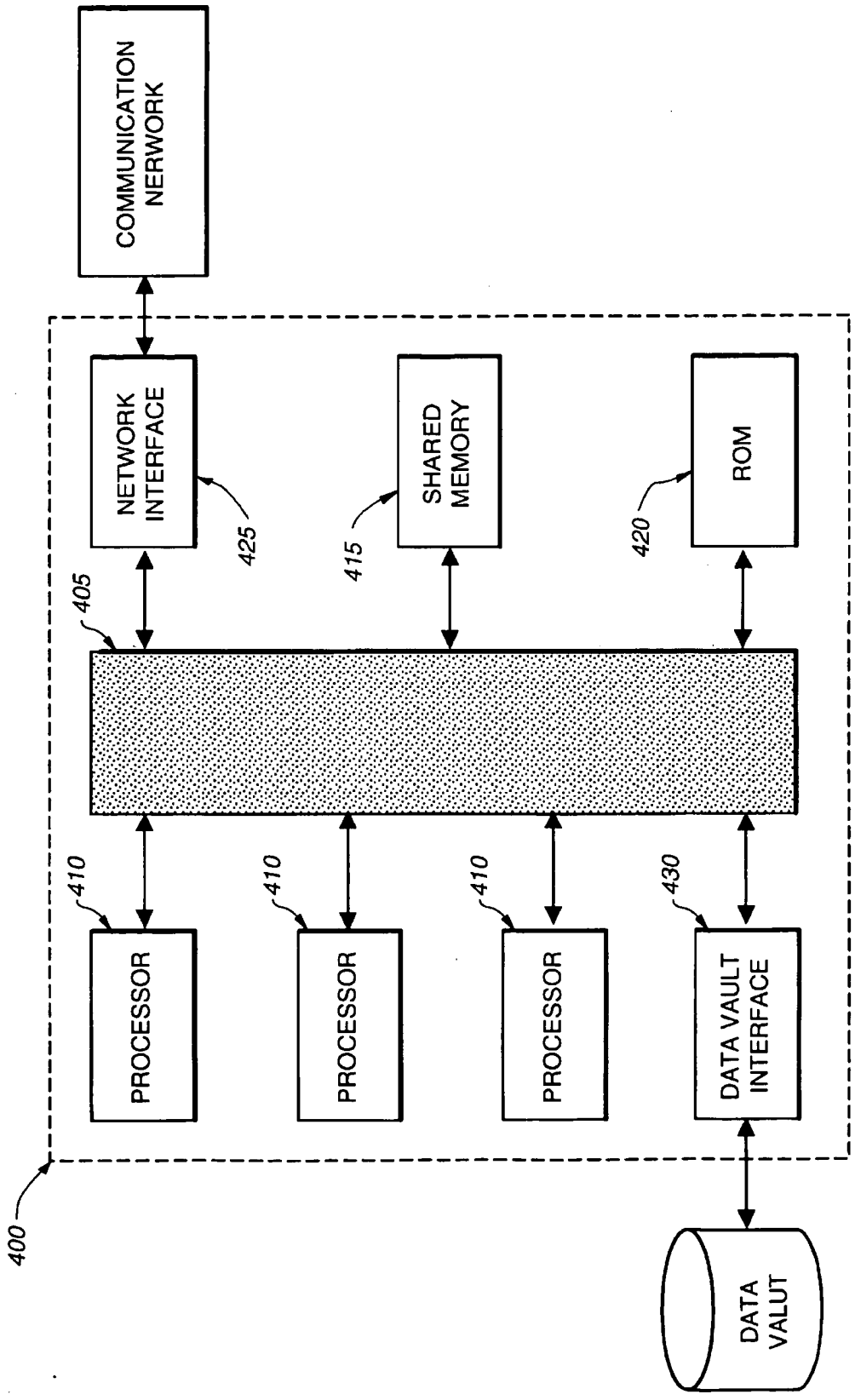
COMMUNICATION NERWORK
NETWORK INTERFACE
425
SHARED MEMORY
415
ROM
420
405
410
PROCESSOR
410
PROCESSOR
410
PROCESSOR
430
DATA VAULT INTERFACE
400
DATA VALUT

Fig. 4

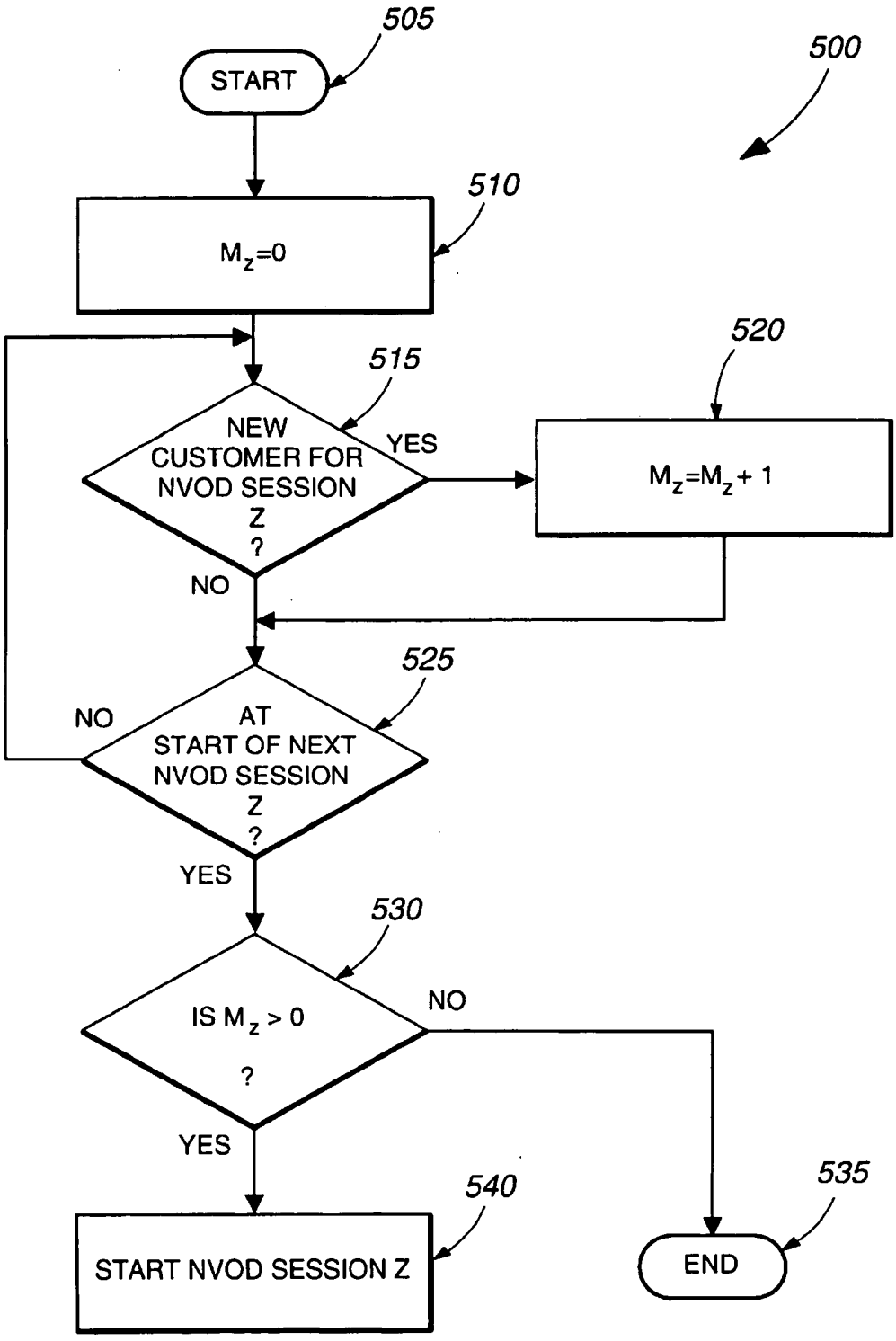
505
500
START
510
M_z=0
520
515
NEW CUSTOMER FOR NVOD SESSION Z ?
YES
M_z=M_z + 1
NO
525
NO
AT START OF NEXT NVOD SESSION Z ?
YES
530
IS M_z > 0 ?
NO
YES
535
540
START NVOD SESSION Z
END

Fig. 5

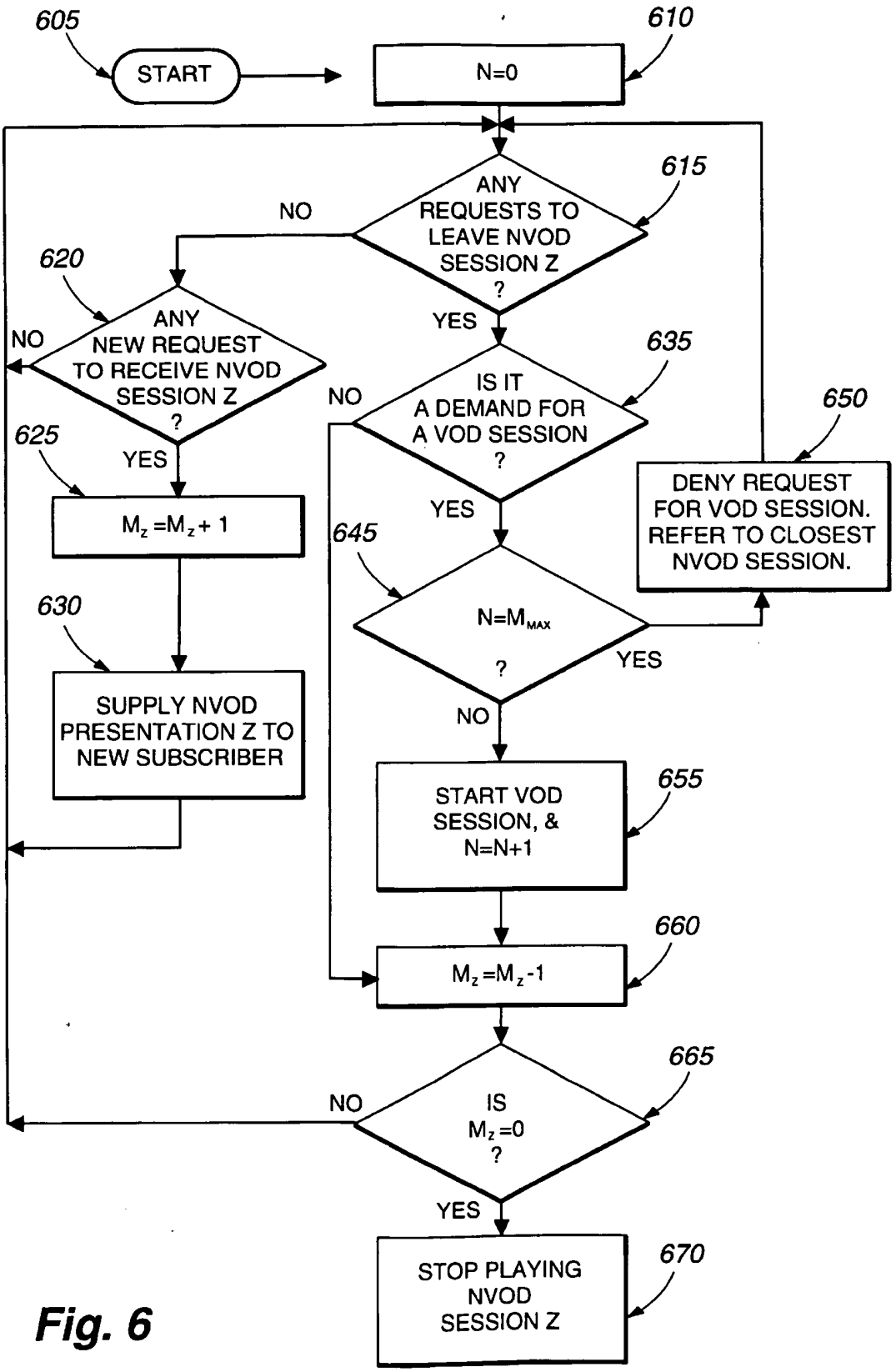
605
START
610
N=0
615
ANY REQUESTS TO LEAVE NVOD SESSION Z ?
NO
YES
620
ANY NEW REQUEST TO RECEIVE NVOD SESSION Z ?
NO
YES
625
$M_z = M_z + 1$
630
SUPPLY NVOD PRESENTATION Z TO NEW SUBSCRIBER
635
IS IT A DEMAND FOR A VOD SESSION ?
NO
YES
645
$N = M_{MAX}$?
YES
NO
650
DENY REQUEST FOR VOD SESSION. REFER TO CLOSEST NVOD SESSION.
655
START VOD SESSION, & N=N+1
660
$M_z = M_z - 1$
665
IS $M_z = 0$?
NO
YES
670
STOP PLAYING NVOD SESSION Z

Fig. 6

METHOD AND APPARATUS FOR PROCESSING REQUESTS FOR VIDEO PRESENTATIONS OF INTERACTIVE APPLICATIONS IN WHICH VOD FUNCTIONALITY IS PROVIDED DURING NVOD PRESENTATIONS

The present invention is directed towards a method and apparatus for processing requests for video presentations of interactive applications.

BACKGROUND OF THE INVENTION

Traditionally, television has been used as a passive device, that only allows a viewer to control the volume and channel, while reserving control of the content as well as the presentation time and format for the service provider. In recent years, however, a number of interactive systems have been created, in order to enable viewers to use their televisions as interactive devices.

Specifically, with the advent of interactive services in the home entertainment field, televisions have become active devices, that allow their viewers greater flexibility and control over the content, the presentation time, and the presentation format of their selected interactive applications. Interactive applications are stored programs, whose operations are wholly or partly controlled by commands from local viewing nodes of the interactive system.

Interactive systems utilize a mix of broadcast and point-to-point communication modes. In particular, interactive systems transmit shared, one-way, broadcast digital information streams to all their subscribers, in order to provide cable and network programming to their subscribers. Interactive systems also utilize a number of dedicated, two-way communication paths to (1) provide interactive applications from a central service source to a local viewing node, and (2) relay commands from the local viewing node to the central service source. In addition, some interactive systems transmit interactive applications through shared information streams.

Establishing a dedicated communication link expends a certain amount of an interactive system's shared resources (such as a service source's server resources, a communication network's transmission bandwidth and switching resources, etc.). Consequently, as typical interactive systems have finite resources due to financial considerations, these systems do not transmit each of their interactive applications to all of their possible viewers over dedicated communication links simultaneously. Rather, efficient interactive systems are often designed to handle specified peak dedicated-path-usage rates, which are computed by using statistics and probability. This type of peak rate design is analogous to the peak rate design used in telephone systems, which similarly use such a design for reducing hardware costs.

One manner by which prior art interactive systems minimize hardware costs is by only using a near-video-on-demand (NVOD) movie presentation format to provide features similar to VCR functional features (e.g., provide skip forward, skip backward, and pause features to emulate fast forward, rewind, pause VCR features). To emulate VCR functional features exactly, an interactive entertainment system would have to provide a true video-on-demand (VOD) presentation of an interactive application to a viewer. A VOD presentation of an interactive application is a version of the application that is transmitted to the viewer over a dedicated communication path. In other words, for a VOD presentation, the viewer would need to receive the interactive application through a dedicated communication link, which, in turn, would enable the viewer to completely control the presentation of the interactive application (i.e., would enable the viewer to exercise VCR functional features, such as fast forward, rewind, pause, etc.).

However, in order to achieve network efficiency, prior art interactive entertainment systems forego VOD presentations of interactive applications, and thereby do not provide the exact VCR functional features to their viewers. Instead, prior art interactive entertainment systems provide their viewers NVOD presentations of interactive applications, in order to offer features that crudely approximate VCR functional features.

In NVOD programming, the interactive entertainment system broadcasts several time-shifted versions of an interactive application (i.e., broadcasts duplicate versions of the application, with the starting time of each version offset by a unique, predetermined time increment) to all of its subscribers over shared communication paths. Typically, interactive systems utilize NVOD services to provide several presentations of a movie, where the presentation start-times are staggered so that no two presentations start at the same time.

NVOD programming also permits an interactive system to emulate the functions of a VCR, by enabling the viewer to (1) stop viewing an originally-requested presentation of the interactive application, and (2) start viewing another presentation of the application that started earlier or later than the originally-requested presentation. For example, if the viewer selects the skip forward function, the system tunes to the NVOD presentation that started one or more intervals prior to the presentation that the viewer is presently watching. On the other hand, in response to a subscriber command to skip back, the subscriber receives the NVOD presentation that started one or more time intervals after the currently-viewed version.

Unfortunately, even when prior art interactive communication systems have sufficient resources to support VOD presentations, they unnecessarily limit themselves to only providing NVOD services, as a conservative means for saving their shared resources. Consequently, there is a need in the art for a video-request processing scheme which provides VOD services, when the interactive system has sufficient resources to support such services.

SUMMARY OF THE INVENTION

For an interactive communication system, the invention provides a method and apparatus for processing requests for video presentations of particular interactive applications. One embodiment of the invention initially receives, from a viewing node, a request for a video presentation of a particular interactive application. This embodiment then provides a near-video-on-demand (NVOD) presentation of the interactive application to the viewing node.

At the time of the offer of the NVOD presentation, or during the NVOD presentation, the viewing node might request a video-on-demand (VOD) version of the interactive application. If such a request is made, and if the system's resources would not be constrained by the transmission of the video-on-demand presentation of the interactive application, then this embodiment transmits the video-on-demand version of the interactive application to the viewing node. On the other hand, if the system's resources would be constrained by the transmission of the VOD version, one embodiment of the invention's interactive system again directs the requesting viewer to view a near-video-on-demand version of the particular application.

BRIEF DESCRIPTION OF THE DRAWINGS

The novel features of the invention are set forth in the appended claims. However, for purpose of explanation, several embodiments of the invention are described by reference to the following figures.

FIG. **1** presents an interactive communication system used by the invention.

FIG. **2** presents an example of a service source used in the interactive communication system of FIG. **1**.

FIG. **3** presents another interactive communication system used by the invention.

FIG. **4** presents a server used in the service source of the interactive communication system of FIG. **1**.

FIGS. **5–6** present one embodiment of the invention for processing requests for video presentations of interactive applications.

DETAILED DESCRIPTION OF THE INVENTION

The invention provides a method and apparatus for processing requests for video presentations of interactive applications. In the following description, numerous details are set forth for purpose of explanation. However, one of ordinary skill in the art would realize that the invention may be practiced without the use of these specific details. In other instances, well-known structures and devices are shown in block diagram form in order not to obscure the description of the invention with unnecessary detail.

The invention is adapted to operate in an interactive communication system. One embodiment of the invention initially receives, from a viewing node, a request for a video presentation of a particular interactive application. This embodiment then provides a near-video-on-demand (NVOD) presentation of the interactive application to the viewing node. At the time of the offer of the NVOD presentation, or during the NVOD presentation, the viewing node might request a video-on-demand (VOD) version of the interactive application in order to exercise VCR functional features (such as fast forward, rewind, pause, etc.).

If such a request is made, and if the system's resources would not be constrained by the transmission of the video-on-demand presentation of the interactive application, then this embodiment transmits the video-on-demand version of the interactive application to the viewing node. On the other hand, if the system's resources would be constrained by the transmission of the VOD version, one embodiment of the invention's interactive system again directs the requesting viewer to view a near-video-on-demand version of the particular application.

One embodiment of the invention determines whether the transmission of the VOD version of the requested application would constrain the shared resources of the interactive communication system, by utilizing a mathematical expression to determine the available capacity of the system. In other words, one embodiment of the invention utilizes a mathematical relationship to determine whether the interactive system's shared resources have sufficient bandwidth to support the transmission of the requested VOD version.

Alternatively, as further discussed below, another embodiment of the invention makes this determination by ascertaining whether the transmission of the VOD version would cause the number of transmitted VOD versions of the requested application to exceed a pre-specified maximum number. For example, one embodiment of the invention denies the VOD request if it ascertains that the number of currently transmitted VOD versions of the requested application equals a pre-specified maximum number.

Another embodiment of the invention conserves the systems resources by limiting the total number of transmitted VOD versions for all interactive applications. Specifically, instead of maintaining individual limits for the number of transmitted VOD versions of each interactive application, one embodiment of the invention limits the number of transmitted VOD versions of all interactive applications. Consequently, when the number of all transmitted VOD versions reaches its maximum value, this embodiment of the invention determines that additional VOD transmissions would constrain the system resources, and therefore denies VOD requests until one or more of the active VOD sessions terminate.

FIG. **1** presents an interactive communication system **100** used by the invention. This system includes a number of home terminal nodes **105**, a communication network **110**, a service source **115**. As shown in FIG. **1**, each home terminal node **105** includes a set-top terminal **120** and a television **125**. Each set-top controls the operation of its corresponding television. In particular, through communication network **110**, a set-top (1) establishes a communication link between the television viewer and the service source, (2) presents, via the television, selectable programming options provided by the service source to the viewer, and (3) relays program selections from the viewer to the service source.

FIG. **2** presents an example of a service source used in the interactive communication system of FIG. **1**. As shown in FIG. **2**, one example of the service source includes a number of data storage vaults **205**, a number of media servers **210**, and a cable TV feedline **215**. Service source **200** utilizes data storage vaults **205** and media servers **210** to provide a variety of interactive digital services to the subscribers of the system. Specifically, data storage vaults **205** are used to store the digital programming content, and media servers **210** are used to retrieve the stored digital media in response to requests from the home terminal nodes.

The retrieved digital programs can then be transmitted through a shared information stream or a dedicated information stream. A shared information stream is used to transmit data to a number of subscribers, while a dedicated information stream is used to transmit data to a specific user. In addition, an information stream can be assigned all or part of a frequency band used by the network. As further shown in FIG. **2**, service source **200** also has a cable feedline **215**, which receives cable programming from the local cable company and supplies this programming to the network. The network then broadcasts the cable programming to all of the system's subscribers on shared information streams.

FIG. **3** presents another interactive entertainment system used by the invention. A description of this interactive entertainment system is provided in the United States Application entitled "A Method For Message Addressing In A Full Service Network," filed on Dec. 14, 1995, and assigned to the assignee of the present application. The disclosure of this application is incorporated in the present application by reference.

FIG. **4** presents a server **400** used in service source **200** of FIG. **2**. This server is used to retrieve stored digital interactive applications from data vaults, and to supply these applications to the communication network for transmission to the home terminal nodes. In particular, the role of the video server is to provide storage and playback of the video data and to respond to subscriber requests, such as "pause," "fast forward," "view the next product," etc. In addition,

during operation, the service source's servers also store the operating system necessary for the operation of the interactive communication system.

Server **400** has a shared memory SMP (Symmetric Multiprocessing) architecture, which includes a high-speed system bus interconnecting processors, memory, and data and network I/O subsystems. Specifically, as shown in FIG. **4**, server **400** includes internal bus **405**, processors **410**, shared random access memory **415**, read-only memory (ROM) **420**, network interface **425**, and data vault I/O interface **430**. High-speed bus **405** represents the collective communication interface between the numerous internal modules of server **400**. In addition, this sever utilizes processors **410** for processing digital signals, and thereby controlling the managing the operation of the server.

Processor **410** is directed by the software and firmware instructions that respectively reside in RAM **415** and ROM **420**. In particular, in one embodiment of the invention, server **400** utilizes RAM **415** to store a source code necessary for the operation of the invention (i.e., server **400** utilizes the software residing in RAM **415** to direct the invention's processing of requests for interactive applications by guiding the actions of processor **410**). In another embodiment of the invention, the firmware instructions (i.e., the source code residing in ROM **420**) direct the invention's processing of requests for interactive applications. Server **400** also uses RAM **415** to store temporary variables or other intermediate information during the operation of the processor.

Because the memory and I/O devices are shared equally among all of the processors in the system, this server's architecture is called symmetric multiprocessor systems. Typically, SMP systems scale from one processor to as many as **36** processors. Examples of SMP architecture include the Silicon Graphics, Inc. Challenge server systems and the Sun Microsystems, Inc. SPARC server systems.

In the SMP architecture, the processing load is uniformly distributed across all of the processors in the system. Scheduling algorithms in the kernel allocate processing load to unoccupied or lightly loaded processors. All processors have equal access to the physical memory and see a uniform memory image. Data written to the shared memory by one processor is immediately available to all the other processors. Software processes, both kernel and user, are able to run concurrently, and can be switched arbitrarily among any of the processors in the computer. Since all of the processors are operating out of shared memory, access to critical data and code is protected by locking mechanisms that prevent concurrent access.

As further shown in FIG. **4**, server **400** also includes data vault interface **430**. Through this interface, server **400** reads out data from one or more data vaults, and transfers this data to a buffer area in the shared memory **415**. The data is then transferred from this buffer area to network interface **425** for transmission to the communication network. In one embodiment of the invention, the network interface is an ATM network interface which transfers data to an ATM switch for transmission. Finally, one of ordinary skill in the art would recognize that numerous alternative embodiments of server **210** exist. For example, in one embodiment of the invention, the service source's servers have an MPP (Massively Parallel Processor) architecture.

FIGS. **5** and **6** present one embodiment of the invention for processing requests for video presentations of a particular interactive application. This embodiment of the invention can be implemented as a software or a firmware code of the server or the set-top. The following description pertains to the embodiment of the invention that is implemented as the software of the server.

For one embodiment of the invention, FIG. **5** sets forth the steps performed by one of the service source's servers prior to the start of an NVOD presentation Z of a particular interactive application. The initial step in this figure's flowchart is start step **505**. At this step, process **500** starts at a pre-specified date and time. For example, in one embodiment of the invention, process **500** starts at the designated start-time for receiving requests for NVOD session Z.

The process then transitions to step **510**, during which the server sets the value of NVOD-customer-count variable M_z to zero. Variable M_z represents the number of customers currently viewing, or currently waiting in a queue to view, NVOD presentation Z. Moreover, variable Z identifies a unique NVOD version of the interactive application.

From step **510**, the process transitions to step **515**, during which a determination is made whether NVOD session Z has a new subscriber. One embodiment of the invention determines that NVOD session Z has a new subscriber when (1) a subscriber requests a video presentation of the interactive application, (2) the system provides the viewer with the option of viewing NVOD session Z, which starts at, or close to, the requested start-time, and (3) the subscriber accepts this option.

If, at step **515**, process **500** determines that NVOD session Z has a new subscriber, the process transitions to step **520** to increment the NVOD-customer-count variable M_z by one. From step **520**, the process then transitions to step **525**, during which the process decides whether the start-time for the presentation of NVOD session Z has been reached. If not, the process (1) assign the viewer's request to a queue, which holds all the requests for NVOD session Z, and (2) transitions back to step **515**.

The process also transitions to step **525** from step **515**, if it determines that NVOD session Z does not have a new subscriber. Moreover, if (at step **525**) the process determines that the presentation start-time has passed, the process transitions to step **530**. At this step, process **500** examines the value of NVOD-customer-count variable M_z. If this count is not greater than zero, the process transitions to step **535** to terminate its operation. However, if the count is greater than zero, the process transitions to step **540**, where it starts NVOD presentation Z by transmitting NVOD version Z on a shared information stream to all of the requesting subscribers (whose requests were previously placed in the queue for session Z, at step **525**).

For one embodiment of the invention, FIG. **6** sets forth the steps performed by one of the service source's servers during the playing of NVOD presentation Z. The first step in the flowchart of FIG. **6** is the start step **605**, which corresponds to step **540** of FIG. **5**. Next, the process transitions to step **610**, where it sets a VOD-customer-count variable N to zero. Variable N represents the number of customers that have left NVOD session Z to view VOD versions of the particular interactive application.

From step **610**, the process transitions to step **615** to determine whether a subscriber has recently requested to leave NVOD session Z. If, at step **615**, the process does not encounter any such requests, the process transitions to step **620**. At this step, the process determines if a new subscriber has requested to receive NVOD session Z, whose presentation is already in progress. If not, process **600** transitions back to step **615**. However, if a subscriber has recently requested to receive NVOD session Z, the process (1)

initially transitions to step **625** to increment the NVOD-customer-count variable by one, (2) then transitions to step **630** to supply NVOD presentation Z to the new subscriber, and (3) eventually transitions back to step **615**.

On the other hand, if (at step **615**) the process determines that a subscriber has requested to leave NVOD session Z, the process transitions to step **635**. At this step, the process determines if the subscriber's request is a demand for terminating NVOD session Z to begin a VOD session. If not, the process transitions to step **660** to decrement the NVOD-customer-count variable by one.

If, at step **635**, the process determines that the subscriber's request is a demand for a VOD session, it transitions to step **645**, where the process examines the value of VOD-customer-count variable N. If this value equals the maximum VOD-customer-count value, the process transitions to step **650** (1) to deny the request for the VOD presentation, in order to conserve the resources of the interactive system, and (2) to refer the viewer to the NVOD session closest to the requested VOD session. The process then transitions back to step **615**.

If, at step **645**, the process determines that the VOD-customer-count N does not equal the maximum VOD-customer-count N_{max}, the process transitions to step **655** (1) to start the requested VOD session by transmitting a video presentation of the interactive application through a dedicated information stream to the requesting subscriber, and (2) to increment the VOD-customer-count variable N by one. Next, process **600** transitions to step **660**, in order to decrement the NVOD-customer-count variable by one.

From step **660**, the process transitions to step **665** to determine whether the NVOD-customer-count variable M_z equals zero. If so, the process transitions to step **670** to terminate the NVOD session Z. Otherwise, the process transitions back to step **615** to wait for a viewer to leave the session, for a viewer to join the session, or for the session to terminate.

The invention has been described above by reference to process **600**, which conserves the shared resources of the system by having pre-specified limits for the number of transmitted VOD versions of each interactive application. However, one of ordinary skill would recognize that an alternative embodiment of the invention limits the number of transmitted VOD versions of all interactive applications, in order to prevent the system's shared resources from being constrained.

In other words, another embodiment of the invention conserves the systems resources by limiting the total number of transmitted VOD versions for all interactive applications. Consequently, when the number of all transmitted VOD versions reaches its maximum value, this embodiment of the invention determines that additional VOD transmissions would constrain the system resources, and therefore denies VOD requests until one or more of the active VOD sessions terminate.

Alternatively, another embodiment of the invention utilizes a mathematical relationship to determine that the transmission of the VOD version of the requested application would constrain the shared resources of the interactive communication system. In particular, one embodiment of the invention utilizes a mathematical expression to determine whether the interactive system's shared resources have sufficient bandwidth to support the transmission of the requested VOD version. One example of such a mathematical relationship is:

```
IF
    {(Current_NetworkBandwidth + Requested_NetworkBandwidth)>
    Total_NetworkBandwidth)},
    {(Current_SCSIBandwidth + Requested_SCSIBandwidth)>
    Total_SCSIBandwidth)},
    {(Current_SwitchBandwidth + Requested_SwitchBandwidth)>
    Total_SwitchBandwidth)}, OR
    {(Current_ServerBandwidth + Requested_ServerBandwidth)>
    Total_ServerBandwidth)},
THEN resources constrained.
```

In the above-recited equation, (1) NetworkBandwidth variables represent the capacity of the transmission frequency bands used by the communication network, (2) the SCSIBandwidth variables represent the relaying capacity of the SCSI interconnect connecting the servers to the data vaults, (3) the SwitchBandwidth variables represent the switching capacity of the ATM switches of the communication network, and (4) the ServerBandwidth variables represent the processing capacity of the servers.

In addition, the variables that have the "Current" prefix represent the portion of the particular bandwidth that is currently being used, while the variables that have the "Requested" prefix represent the portion of the particular bandwidth necessary for the transmission of the requested VOD version. Also, the variables that have the "Total" prefix represent the total amount of the particular bandwidth. The values of all these variables are determined by utilizing conventional traffic management algorithms.

The invention is advantageous because it provides a video-request processing method and apparatus for providing VOD services when the interactive system has sufficient resources to support such services. For example, the invention maintains the efficiency of an interactive system by providing popular movies in a NVOD format to a majority of the system subscribers, while utilizing the available system bandwidth to provide some subscribers with true VOD capability. In turn, by providing subscribers with VOD versions of interactive applications, the invention enables the system subscribers to exercise VCR functional features, such as fast forward, rewind, pause, etc.

While the invention has been described with reference to numerous specific details, one of ordinary skill in the art would recognize that the invention can be embodied in other specific forms without departing from the spirit of the invention. For example, one of ordinary skill in the art would recognize that, although the invention has been described by reference a home terminal node that includes a set-top terminal and a television, alternative embodiments of the invention utilize home terminal nodes that include a cable modem and a computer. In these embodiments, a display device of the computer is used for displaying the transmitted programming.

In addition, even though one embodiment of the invention has been described by reference to a terrestrial communication network, one of ordinary skill in the art would realize that an alternative embodiment of the invention utilizes a satellite communication system. Also, although each local viewing node **105** of FIG. **1** only has one set-top and one television, one of ordinary skill in the art would appreciate that in an alternative embodiment of the invention each local viewing node has multiple viewing stations. Thus, one of ordinary skill in the art would understand that the invention is not to be limited by the foregoing illustrative details, but rather is to be defined by the appended claims.

I claim:

1. In an interactive communication system, a method of processing requests for video presentations of interactive applications, said method comprising the steps of:

(a) receiving a request, from a viewer, for a video presentation of an interactive application;

(b) presenting to said viewer a near-video-on-demand version of said interactive application;

(c) receiving a request, from said viewer, for a video-on-demand version of said interactive application;

(d) determining if said transmission of said video-on-demand version of said interactive application would constrain resources of the interactive communication system; and

(e) presenting said video-on-demand version of said interactive application to said viewer, if said presentation of said video-on-demand version of said interactive application would not constrain resources of the interactive communication system.

2. The method of claim 1 further comprising the step of denying said request for said video-on-demand version of said interactive application, if said presentation of said video-on-demand version of said interactive application would constrain resources of the system.

3. The method of claim 1, wherein said viewer requests a video-on-demand version of said interactive application in order to exercise VCR functional features.

4. The method of claim 1, wherein said determining step includes a step of determining if the number of currently presented video-on-demand presentations of said interactive application equals a predetermined maximum number.

5. The method of claim 1, wherein said determining step includes a step of determining if the number of currently presented video-on-demand presentations of a plurality of said interactive applications equals a predetermined maximum number.

6. The method of claim 1, wherein said determining step includes a step of utilizing a mathematical relationship to determine whether said interactive system's resources have sufficient bandwidth to support the transmission of the requested video-on-demand version.

7. In an interactive communication system, a method of processing requests for video presentations of interactive applications, said method comprising the steps of:

(a) receiving a request, from a viewing node, to transmit a video presentation of an interactive application;

(b) transmitting to said viewing node a near-video-on-demand version of said interactive application through a shared information stream;

(c) receiving a request, from said viewing node, to transmit a video-on-demand version of said interactive application through a communication network;

(d) determining if transmission of said video-on-demand version of said interactive application through a communication network would constrain shared resources of the interactive communication system; and

(e) transmitting said video-on-demand presentation of said interactive application, if said transmission of said video-on-demand version would not constrain resources of the system.

8. The method of claim 7 further comprising the step of denying said request for the transmission of said video-on-demand version of said interactive application and providing said viewing node with an option to view another near-video-on-demand version of said interactive application.

9. The method of claim 7, wherein said viewing node requests a video-on-demand version of said interactive application in order to exercise VCR functional features.

10. The method of claim 7, wherein said determining step includes a step of determining if the number of currently presented video-on-demand versions of said interactive application equals a predetermined maximum value.

11. The method of claim 7, wherein said determining step includes a step of determining if the number of currently presented video-on-demand versions of a plurality of interactive applications equals a predetermined maximum value.

12. The method of claim 7, wherein said determining step includes a step of utilizing a mathematical relationship to determine whether said interactive system's resources have sufficient bandwidth to support the transmission of the requested video-on-demand version.

13. An apparatus for processing requests for video presentations of interactive applications, said apparatus adapted to operate in an interactive communication network, said apparatus comprising:

(a) receiving means for receiving requests to transmit video presentations of interactive applications;

(b) determining means, coupled to said receiving means, for determining if transmission of video-on-demand versions of said interactive applications through a communication network would constrain shared resources of the interactive communication system; and

(c) responding means, coupled to said determining means, for

(1) responding to an initial request from a viewer for a video presentation of an interactive application by transmitting to said viewer a near-video-on-demand version of said interactive application through a shared information stream, and

(2) responding to a subsequent request from said viewer for transmission of a video-on-demand version of said interactive application through a communication network by transmitting said video-on-demand presentation, if said determining means determines that said transmission would not constrain resources of the interactive communication system.

14. The apparatus of claim 13, wherein said responding means denies said request for the transmission of said video-on-demand version of said interactive application and provides said viewer with an option to view a near-video-on-demand version of said interactive application, when said transmission of said video-on-demand version of said 'interactive application would constrain resources of the system.

15. The apparatus of claim 13, wherein said viewer requests a video-on-demand version of said interactive application in order to exercise VCR functional features.

16. The apparatus of claim 13, wherein said determining means includes means for determining if the number of currently presented video-on-demand versions of said interactive application equals a predetermined maximum value.

17. The apparatus of claim 13, wherein said determining means includes means for determining if the number of currently presented video-on-demand versions of a plurality of interactive applications equals a predetermined maximum value.

18. The apparatus of claim 13, wherein said determining means includes means for calculating available bandwidth of said interactive system's resources in order to determine if said resources can support the transmission of the requested video-on-demand version.

19. An interactive communication system comprising:

(a) a service source storing a plurality of interactive applications;

(b) a plurality of viewing nodes for viewing said interactive applications; and

(c) a communication network coupling said service source and said viewing nodes;

(d) wherein said service source includes means for processing requests for video presentations of said interactive applications, said processing means including:

(1) receiving means for receiving requests to transmit video presentations of interactive applications;

(2) determining means, coupled to said receiving means, for determining if transmission of video-on-demand versions of said interactive applications through a communication network would constrain shared resources of the interactive communication system; and

(3) responding means, coupled to said determining means, for (i) responding to an initial request from a viewer for a video presentation of an interactive application by transmitting to said viewer a near-video-on-demand version of said interactive application through a shared information stream, and (ii) responding to a subsequent request from said viewer for transmission of a video-on-demand version of said interactive application through a communication network by transmitting said video-on-demand presentation, if said determining means determines that said transmission would not constrain resources of the interactive communication system.

20. The apparatus of claim 19, wherein said responding means denies said request for the transmission of said video-on-demand version of said interactive application and provides said viewer with an option to view a near-video-on-demand version of said interactive application, when said transmission of said video-on-demand version of said interactive application would constrain resources of the system.

21. The apparatus of claim 19, wherein said viewer requests a video-on-demand version of said interactive application in order to exercise VCR functional features.

22. The apparatus of claim 19, wherein said determining means includes means for determining if the number of currently presented video-on-demand versions of said interactive application equals a predetermined maximum value.

23. The apparatus of claim 19, wherein said determining means includes means for determining if the number of currently presented video-on-demand versions of a plurality interactive applications equals a predetermined maximum value.

24. The apparatus of claim 19, wherein said determining means includes means for calculating available bandwidth of said interactive system's resources in order to determine if said resources can support the transmission of the requested video-on-demand version.

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